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L. WOLFF, M.D.,

CLINICAL PROFESSOR OF MEDICINE, WOMEN'S MEDICAL COLLEGE OF
PENNSYLVANIA; PHYSICIAN TO THE GERMAN HOSPITAL OF
PHILADELPHIA; DEMONSTRATOR OF CHEMISTRY,
JEFFERSON MEDICAL COLLEGE.



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EROSIONS and ulcerations of the gastric mucous membrane often occur as a result of trauma, and, as was long ago observed, readily heal without presenting the characteristic symptoms of "ulcus ventriculi," also known as simple, round, chronic, peptic, corrosive, or perforating ulcer, according to its shape, extent, and the fancy of authors.

Cruveilhier (1829-1835) appears to have been the first to recognize it as an independent affection, and to define its pathologic character. The subject was further elaborated and brought to a clearer understanding by Rokitansky and Virchow, who explained it as depending on a disturbance of circulation, with necrotic changes in the tissues supplied by the affected vessels.

These views have, from time to time, undergone some modifications, so that now autodigestion of the stomach within a circumscribed area is accepted

¹ Read at a meeting of the J. Aitken Meigs Medical Society of Philadelphia.



as the pathologic condition associated with the affection. This conception is based upon the assumption that under normal conditions the alkalinity of the circulating blood prevents autodigestion of the stomach, while with the cessation of the circulation after sudden death during the digestive process the stomach undergoes a greater or less self-digestion (gastromalacia.) Any disturbance of the circulation of the mucous membrane of the stomach, whether by hemorrhage into it or by embolic processes within its vessels, must therefore be regarded as a predisposing factor in the production of a peptic ulcer. The exciting element, as already stated, is generally considered to be the action of the digestive secretions on the area deprived of the circulating medium, which, both directly and by diffusion, maintains an alkalinity of the tissues not overcome by the ordinary amount of hydrochloric acid in the digestive fluids.¹

The ulcer so formed is by no means always round, as an inappropriate designation might imply, but may be variously shaped. It has clean-cut edges, and, as a rule, a clean fundus. It is principally met with in patients between eighteen and thirty years of age, and is found more commonly in women than in men. It shows a tendency to extend in depth to a greater degree than in surface, and is often funnel-shaped. It is generally situated upon

¹ This is disputed by G. Bunge (*Lehrbuch der physiologischen und pathologischen Chemie*), who, while offering no other explanation than the resistance of the living cell, asks, in contradiction to the above, why the pancreas is not digested by its alkaline trypsin.

the posterior wall of the stomach, near the pylorus, and, as a rule, is solitary rather than multiple. Ulcers extending to the deeper layers of the stomach may give rise to perforation, which, if not followed by fatal peritonitis, may result in adhesions to neighboring viscera. I have recently observed such a case in which, at the post-mortem examination, extensive adhesions between stomach, liver, pancreas, and spleen were found.

One of the most characteristic and important complications of peptic ulcer is hemorrhage from eroded vessels, and the resulting hematemesis. This, in connection with the other symptoms, may be considered as almost pathognomonic.

The tendency of gastric ulcer is generally toward recovery. The resulting cicatrization may cause serious complications by stenosis of the pylorus, and consequent gastrectasis, or even irregular contractions of the viscus. A suggestion of importance is the possibility of subsequent malignant development in cicatrices.

By far the most important and gravest symptom is, without doubt, the excessive hemorrhage that at times occurs. Of forty-three cases of undoubted gastric ulcer that I have followed, both in my own practice, as well as in that of others, in no less than four did fatal hemorrhage result.

Hyperacidity is usually mentioned as an accompaniment of gastric ulcer, and considerable importance has been attached to it. It is true that in many cases the mechanical irritation of the eroded surface by the food causes increased peristalsis and hypersecretion; but in quite a number of cases that

I have had the opportunity of examining with this end in view, I have found only normal amounts of hydrochloric acid after the usual test-meal, and it is to my mind doubtful whether the hyperacidity so often mentioned in connection with gastric ulcer is as common as it is made to appear. While gastric hyperacidity often produces intestinal indigestion and intestinal catarrhs, resulting in mal-assimilation, malnutrition, and anemia, which in turn may cause disease of the vessels, and thus predispose to peptic ulcer, I have yet to find that hyperacidity is more common in patients with gastric ulcer than in other persons.

Among the symptoms most noticeable in connection with ulcer of the stomach, pain deserves first attention. It is true that cicatrices of ulcers have been found in stomachs of persons who have never been known to complain of gastric pain; nevertheless, the large majority of cases are brought to our notice by the circumscribed pain in the epigastrium, radiating to the back below the scapulæ. The pain is characterized by its paroxysmal occurrence and its relation to the taking of food. Thus, coarse food or large meals may cause most distressing gastralgia, and even a moderate meal may give rise to burning pain, which is often accompanied or followed by great nervous anxiety and cardiac palpitation, so that the patient is compelled to loosen his clothing and assume the erect posture. Pressure in the pyloric region increases the pain materially, and may often lead to paroxysms of varying severity. Together with this, the patient feels nauseated, often vomits, complains of heartburn and acid eructa-

tions, which cease only with copious emesis of the acid contents of the stomach, generally brought on by the patient's own interference. The vomited matters may or may not contain bile, but they often contain blood in greater or less quantities.

The great diagnostic importance of hematemesis will be realized if we consider the statement that it takes place in from 40 per cent. to 50 per cent. of all cases of gastric ulcer. I think the diagnosis doubtful in cases in which blood was not vomited, and I consider these figures, therefore, unreliable, and the average as greater. When the hemorrhage is large, it may be followed by syncope, and certainly by nausea, and if frequently repeated the patient may sink from loss of blood, which may be expelled by the bowel as well as by the mouth. The dejecta, under such conditions, usually appear as a black, coherent mass, of soft consistence and tarry color, though unchanged blood may, in aggravated cases, be found therein. The ejecta are usually mixed with food, but may be pure blood, generally coagulated, dark, and often fetid, but never frothy, as in hemoptysis; nor is the ejection accompanied by the characteristic cough of the latter.

As hematemesis is met with in cirrhosis of the liver, malignant diseases of the stomach, toxic erosions, hemophilia, and may result from trauma from foreign bodies in the stomach, it is necessary to exclude these in basing a diagnosis of gastric ulcer on hemorrhage, principally or alone. As corroborative of peptic ulcer, in conjunction with other symptoms, may be considered the dyspepsia accompanying it. This is manifested by a capricious appetite or even

anorexia, eructation and pyrosis, with the so-called "heartburn," which often leaves a sensation of acid acting on the teeth. Together with this, constipation is the rule, varied though at times with occasional diarrhea and the popularly so-called "bilious" spells, with frontal headache.

The chemical examination of the gastric secretions, which has to be conducted with extreme caution, shows, according to some authors, a hydrochloric hyperacidity of from 0.3 per cent. to 0.35 per cent., a finding however, with which, from my own observations, as already stated, I cannot agree. Thus I have found that many, if not one-half of the cases, show a normal acidity, or even occasionally a subacidity.

Measurement shows no ectasis and the motor functions are generally excellent and may be increased. The ectasis resulting from subsequent pyloric stenosis cannot be viewed as symptomatic of the acute affection, though hyperacidity itself may bring about pyloritis and consequent ectasis.

As symptomatic of ulcer and resulting from the copious hemorrhage must be mentioned the extreme anemia that frequently suggests malignancy. It is often difficult to differentiate this secondary anemia from that of the progressive and pernicious type. The recognition of carcinomatous conditions of the stomach, when associated with ulcer, is one of the most perplexing problems for the diagnostician. Fortunately, though the association does exist at times, it is rare. Thus, in a case under my care, the symptoms were those of ulcer alone, when, notwithstanding the fact that the patient had not arrived at the

age when carcinoma is ordinarily suspected, it was found at the autopsy that malignant disease of the cicatrix was undoubtedly the fatal lesion.

The diagnosis of gastric ulcer cannot be made from any one symptom, but must be based upon the corroborative evidence furnished by the complexus of symptoms to which it gives rise. Thus the digestive disturbances and gastralgia, as well as the circumscribed pain on pressure in and below the right hypochondriac region, the paroxysmal character of the pain, principally after the ingestion of food, are sufficient to attract the attention of the diagnostician as suspicious of gastric ulcer. If, added to this, there is the characteristic hematemesis, the clinical picture may be considered to be complete. Though pain may be absent at times, the hematemesis alone, when other sources of hemorrhage can be safely excluded, may serve for purposes of diagnosis. The diagnosis cannot be considered as established when based on the pain in the epigastrium alone, and, in fact, no positive evidence may be had of the presence of ulcer unless the chain of symptoms is made complete by the occurrence of hematemesis.

Gastric ulcer must be differentiated from gastric carcinoma. It may be said that the age of the patient is important, ulcer being more common between the ages of eighteen and thirty, and carcinoma after forty. One may, however, be deceived, as in the case already quoted. Rapid emaciation, with cachexia, as well as the presence of tumescence in the right hypochondrium, bespeak carcinoma, although tumefaction may at times also be found with pyloritis re-

sulting from ulcer, and may even be wanting in carcinoma situated on the greater curvature and posteriorly, as I have had occasion to observe. That a chronic affection of the stomach which continues over a period of three years, and though accompanied with emaciation, but without cachexia and without a palpable tumor, may be viewed as resulting from chronic ulcer, can be accepted as a safe rule, but one which is not without exception. The presence of a more rapidly developing tumescence in the epigastrium may, however, always be considered as evidence of malignancy.

The prognosis of gastric ulcer may, in the main, be said to be favorable, though, as already pointed out, the occurrence of fatal hemorrhage and the complication of progressive anemia, as well as malignant complications, may bring about a moderate percentage of deaths. The proportion of deaths among the forty-three cases that I have followed corresponds with the general statistics recorded. The perforative ulcer offers very few chances, though it has been known to leave adhesions which in themselves may not prove fatal.

The treatment of gastric ulcer may be summed up in a very few words. The primary indication is physiologic rest. If we consider that the presence in the stomach of food and acid secretions stimulates peristalsis, and that peristalsis is adverse to the restorative process, the indications for the control of both are at once established. As an adjuvant to this end and of the greatest importance, is absolute rest in bed. This is necessary, not alone to limit the mobility of the viscus, but it serves the

further purpose of preventing tissue-waste, when nutrition must necessarily be limited or inhibited altogether.

The rest of the treatment may be considered as dietetic and medicinal.

The dietetic management is of the greater importance. While absolute bodily rest is a factor not to be neglected, physiologic rest is best secured by withholding all food by the mouth, and the adoption of a system of rectal alimentation. This will be the better borne, as the bowels are usually torpid and constipated and the colon tolerates large quantities of food very well.

To make alimentary injections the flexible rectal tube should always be used, and then introduced beyond the sigmoid flexure. Before resorting to alimentary enemata, the colon should be well cleansed and emptied by a large clysma of tepid water. It is to be remembered that, though the colon is a powerful absorbing organ, it is not a digestive organ, and that all food introduced into it should be predigested. I have been in the habit of employing for this purpose the glucose syrup of the market. This I dilute with peptonized milk, to which is added a moderate quantity of peptonized beef-extract, or the so-called peptone powder offered by the manufacturing chemists. It is fortunate that these peptonized preparations contain little peptone and more albumose, for it is to the latter rather than to the former that we have to look to furnish nutritive albumin. It is a time-honored custom to add from twenty to forty drops of laudanum to such injections, so that they will be retained by the

bowels. As opium and the opiates have probably but little local anesthetic effect, I have substituted for them half a grain of cocaine for that purpose, with the happiest results. Treated in this way, by giving two ounces of glucose with one ounce of prepared peptone powder in about four ounces of peptonized milk, together with half a grain of cocaine, about three or four times a day, I have seen patients thrive and even gain weight.

It is customary and it is recommended that in gastric ulcer milk be given in large quantities, and milk alone. In several cases so treated I have observed hard coagula of milk to be vomited, after great distress and with great retching, leading to copious hemorrhage. I should modify this method by giving only partially peptonized milk, which will be found not to coagulate on the addition of acids. To introduce milk into a certainly acid and sometimes hyperacid stomach seems to me a folly which is often dearly paid for. As a substitute for peptonized milk, buttermilk (though not as nutritious but more palatable) may be given, but in small quantities at a time. To vary this, home-made mutton-broths, prepared from stock as required, and into which one or two raw eggs are beaten, are to my mind, much more desirable and decidedly more palatable than the various beef-extracts often recommended. With the absence or diminution of pain after ingestion, this liquid may be supplanted by a little well-soaked cream-toast or milk-toast, a little finely-scraped meat (ham is preferred by some), some rice in milk, custards, or a very soft-boiled egg. If these are well borne, the diet may be gradually in-

creased to stewed fowl, mashed potatoes, succulent vegetables, and progressively to ordinary light and full diet. Carbonated waters, champagnes, koumyss, are generally not well borne and are contra-indicated.

The medicinal treatment demands, by the indications, first of all, alkalies, evacuants, correctives, and measures adapted to meet the complications. Probably no remedy has greater repute in this affection than the salts of the waters of Carlsbad. These should be given in hot water, while the patient is fasting. To avoid nausea, the dissolved salts should be administered in broken doses only. While much is said in favor of the natural salts, I find the artificial product equally as efficient and therefore, sometimes, preferable. A teaspoonful of the latter generally suffices for the purpose of a mild laxative. To assure alkalinity, and neutralization of the acid secretions of the ulcerated surface, nothing has served me so well as sodium bicarbonate in doses of from fifteen to twenty or even thirty grains, about from half an hour to one hour after the ingestion of food or liquids, and this may with advantage be combined with bismuth subnitrate. Calcium carbonate and also magnesia are recommended for this purpose, but, in my experience, nothing is so well tolerated by the stomach for any length of time as sodium bicarbonate.

To combat the nausea and vomiting, a pill containing extract of belladonna, gr. $\frac{1}{3}$, and silver nitrate, gr. $\frac{1}{2}$, may be used with advantage; the latter is said to exercise a curative influence on the ulcerated surface, and by being converted into an

insoluble chlorid, diminishes or neutralizes the hydrochloric acid present in the stomach. Pain is best combated by means of subcutaneous injections of morphine. As these may, however, be too frequently called for and lead to a habit not easily broken off, I prefer a pill containing morphine sulphate, gr. $\frac{1}{8}$; cocaine hydrochlorate, gr. $\frac{1}{4}$; extract of cannabis indica, gr. $\frac{1}{2}$, given every three or four hours, after the ingestion of food or liquids. These analgesics may with advantage be supplemented by warm poultices or even warm Priessnitz applications to the epigastrium.

To meet the most serious complication, that of hemorrhage, gallic acid, internally, and ergotin or fluid extract of ergot, hypodermatically, may answer. Pieces of ice should be frequently swallowed. Absolute rest is the *sine qua non*. Should the hemorrhage persist in spite of these measures and assume alarming proportions, Monsel's solution, in doses of three or five drops in a wineglass of water, may be administered every quarter or half-hour. Oil of turpentine and the oil of Canada fleabane are often recommended as hemostatics, but my experience with them in this affection has not been encouraging. If the anemia has reached an alarming degree, and if cerebral anemia is apparent, injections of ether and camphor may be practised, followed, if necessary, by subcutaneous infusion of a sterilized solution containing 0.6 per cent. sodium chlorid, at a temperature of from about 100° to 103° . As much as a pint of this may be injected into the subclavicular spaces, from which they are absorbed with remarkable rapidity. For perforation, little can

probable be done, excepting absolute rest and the exhibition of cardiac stimulants hypodermatically to combat shock, together with the narcotics necessary to arrest pain.

This brings me to the surgical aspect of the treatment. With the present vast advances in abdominal surgery, may we not look hopefully for good results from surgical interference, both in chronic ulceration as well as in uncontrollable hemorrhage? not to speak of the certainly indicated surgical procedure in perforation of the stomach. The good results of Loretta's operation in pyloric stenosis foreshadow a wide field of usefulness for its application to serious cases of peptic ulcer and its more serious complications.

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